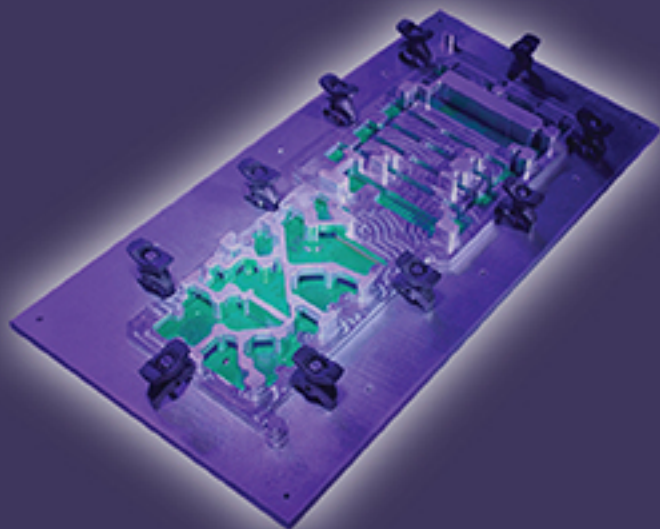
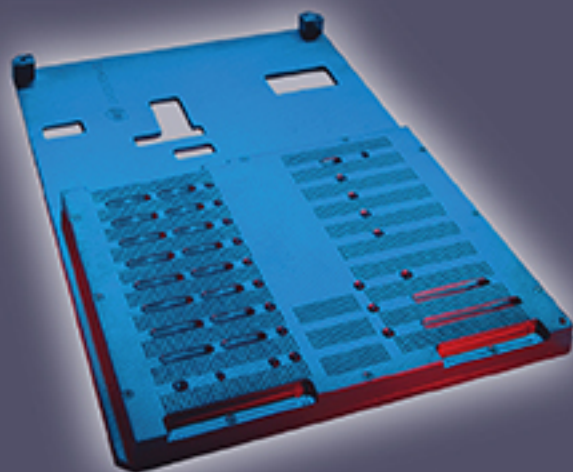
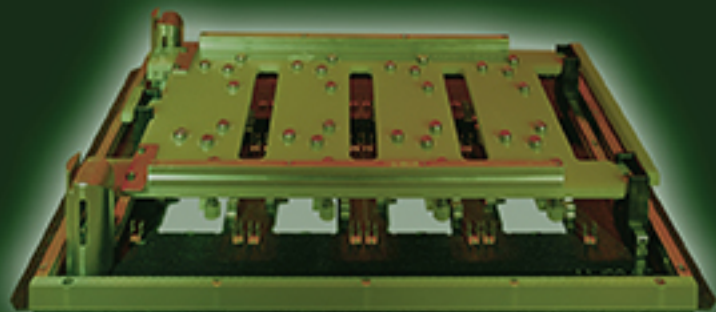


PCB Assembly Process Tooling

# pentagon n

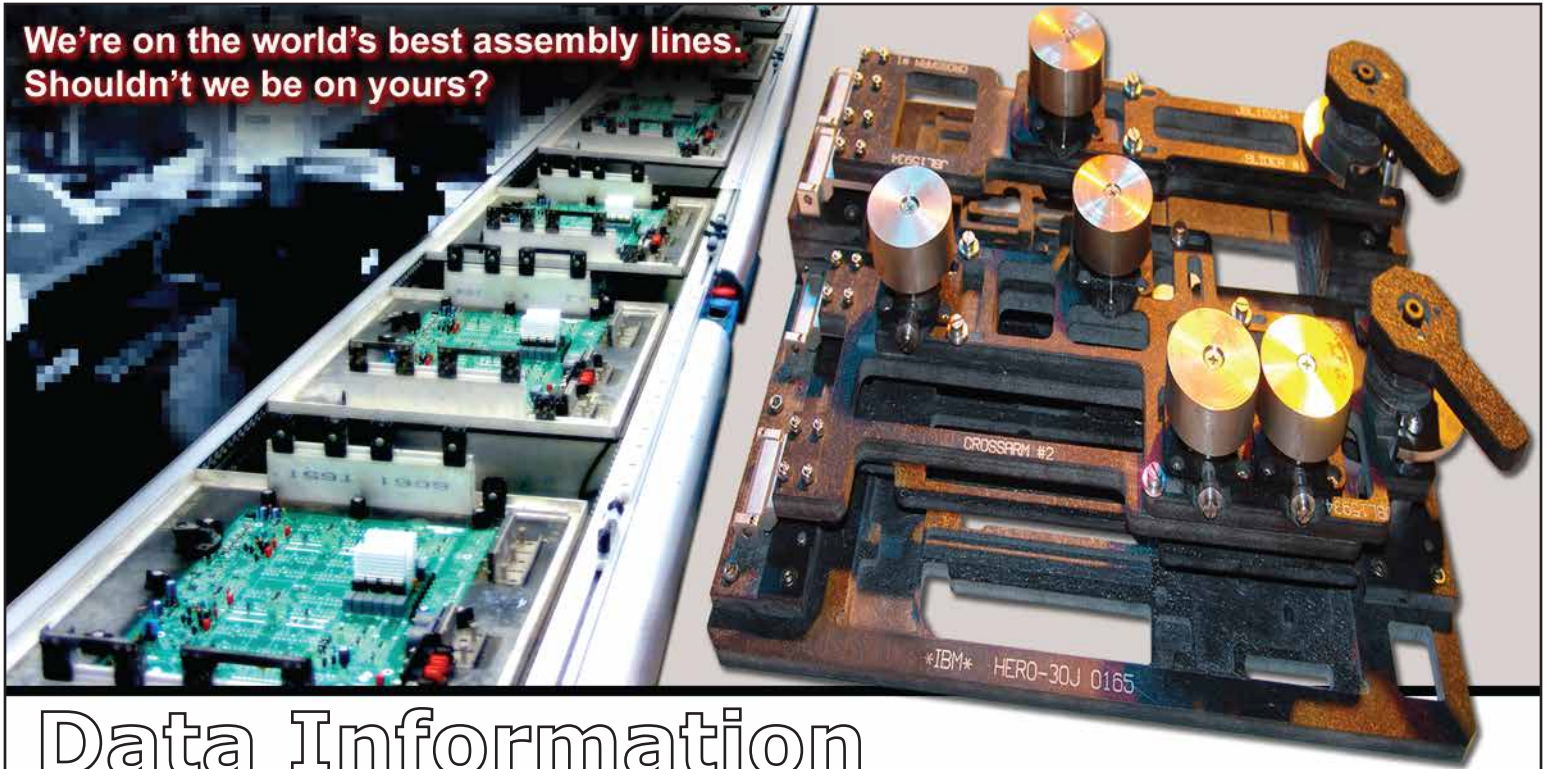
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# Data Information

Pentagon EMS is capable of interpreting the following data formats:

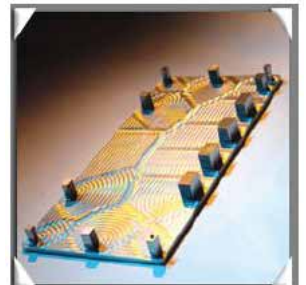
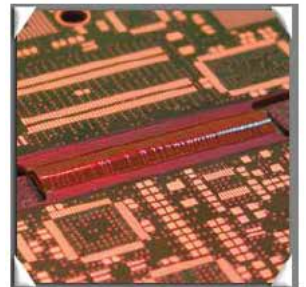
- Gerber: RS-274-D, RS-274-X
- EDIF 400
- NC Drill/Route: Excellon, Sieb and Meyer
- .DXF
- .DWG
- ODB++
- .PLT
- .HPGL
- BARCO (.DPF)

The following are the general data files required for fixture development. Products are processed differently. Supplying us with all of this data will ensure that we have what is needed for your application.

- Top & Bottom Side Silkscreen
- Top & Bottom Side Paste
- Top & Bottom Side Mask
- Fabrication Drawing
- Drill Fab Layer

Other Requirements:

- Height of components on the solder side of the PCB
- Height of components requiring hold downs
- Is any hardware present? If so, size and location
- Identify any components which overhang the board and whether they seat flush to the top of the PCB or recede to a certain depth



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# Products

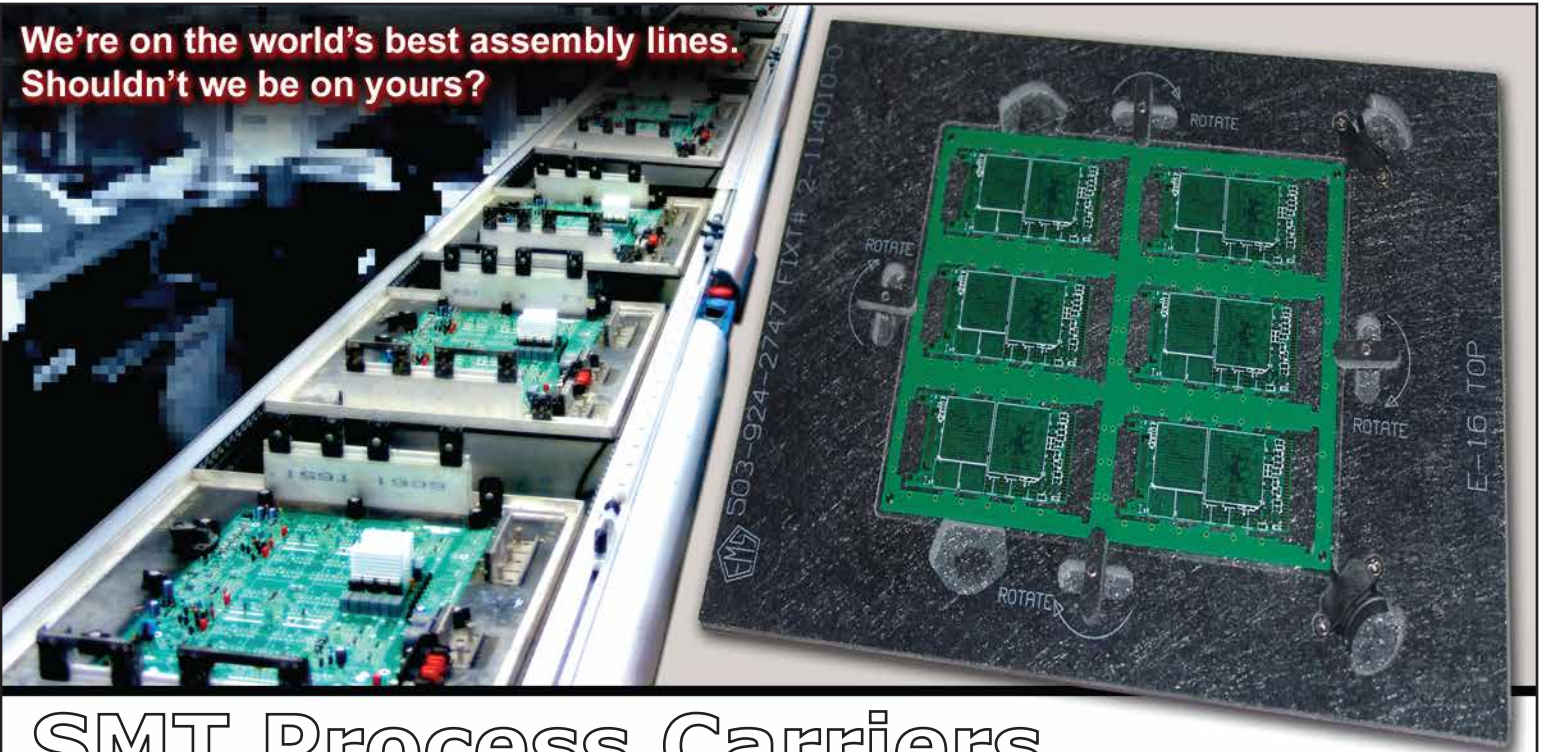
## Total Tooling Solution

Pentagon EMS provides custom tooling solutions that make it possible to improve process speeds, reliability, and throughput, and can also facilitate processes that otherwise could not be accomplished.

This improvement in process ability and performance contributes directly to increased profitability for your projects, while affording you the opportunity to focus on upcoming project opportunities.

- Wave Solder Pallets
- Adjustable Wave Solder Pallets
- Overarm Bars
- Wave Glass
- SMT Process Carriers
- Adjustable SMT Process Carriers
- Printer Plates
- Matrix Trays
- Press-Fit Fixtures
- Press-Fit Top Tooling
- Conformal Coating Fixtures
- AOI Fixtures
- 5DX Fixtures
- Flying Probe Fixtures
- Functional Test Fixtures
- Vibration Test Fixtures
- Rework Tables
- Solder Pot Fixtures
- Wash Baskets
- Mechanical Assembly

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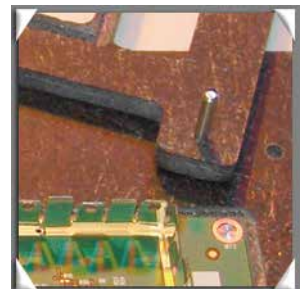
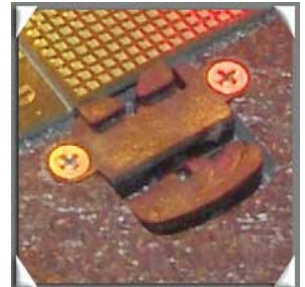
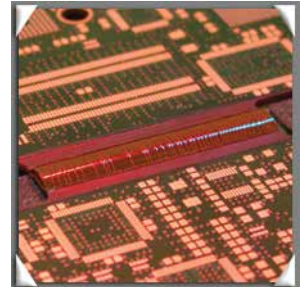


# SMT Process Carriers

**Increase accuracy and repeatability** in your surface mount operations. SMT Process Carriers are **necessary for processing** any type of **flex or rigid-flex** circuitry and also makes it **possible to process odd shaped PCB's** or circuit boards that have **components placed close to the board edge**.

SMT Process Carriers from Pentagon EMS are designed to support the PCB without interference through each step of the surface mount process. Our flush mounted PCB holddowns **will not interfere with any printing or placement operations**. Our SMT fixtures are also designed to reduce the maximum amount of thermal mass possible so they will be as transparent to the process as possible.

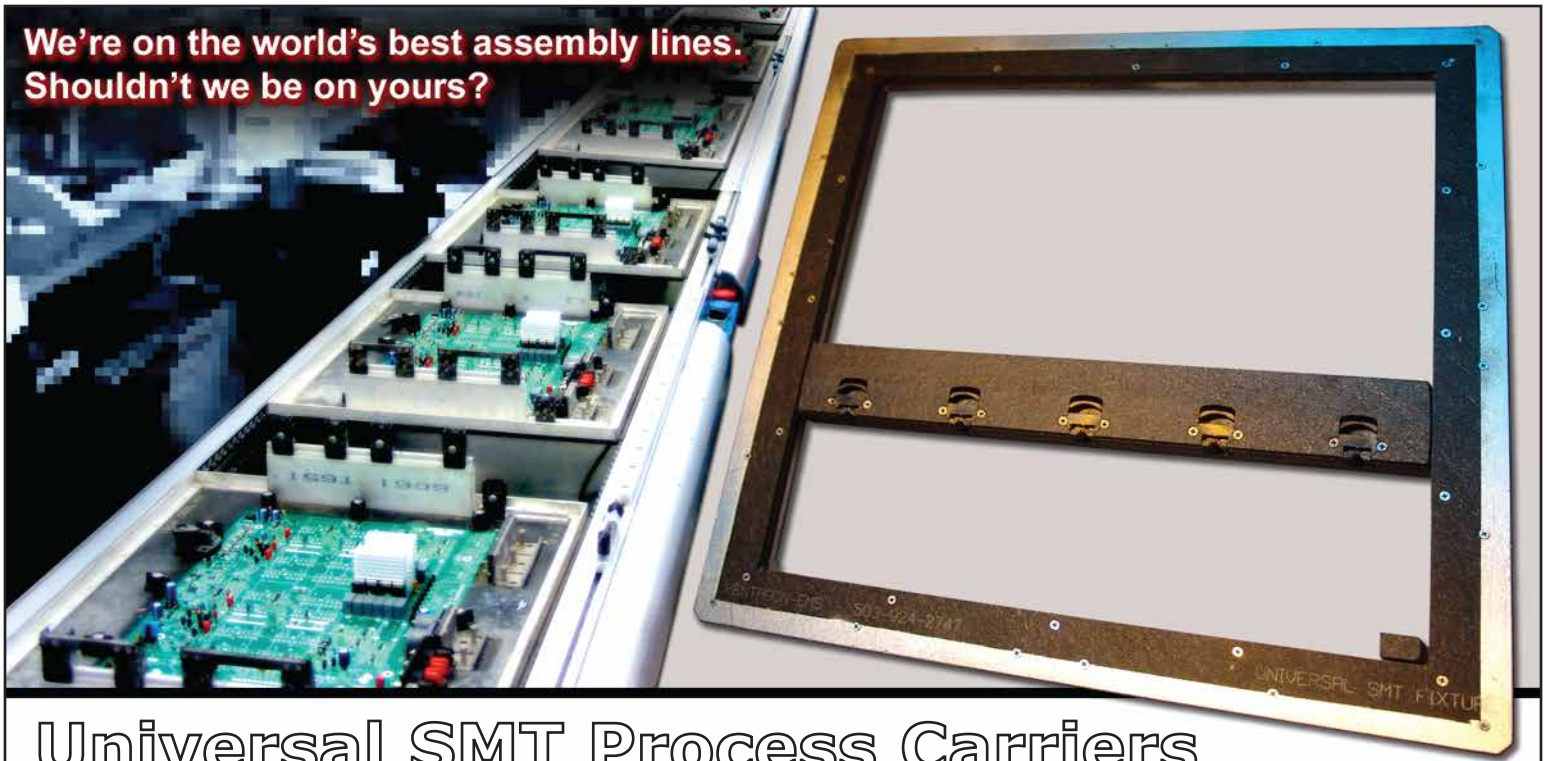
- Required for rigid-flex and flex circuit processing
- Process odd-shaped PCB's
- Process PCB's with components close to the edge of the board
- Flush-mounted PCB holddowns
- Designed to support the board through printing, placement and reflow
- Options available for securing topside or bottomside components through reflow
- Usability Guarantee
- Rewards Program



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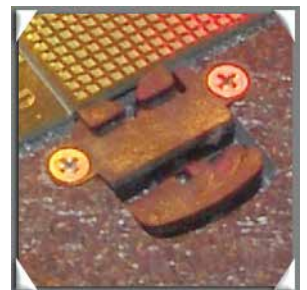
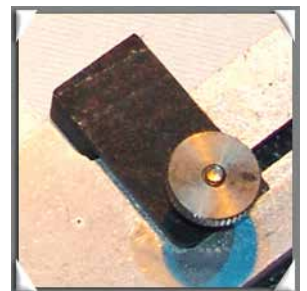
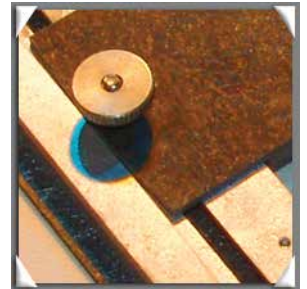


## Universal SMT Process Carriers

**Process a wide variety of board shapes and sizes with a single fixture.** Pentagon EMS Adjustable Surface Mount Pallets also allow processing of PCB's that have components located to close to the board edge to be run on the conveyor on their own.

These Adjustable Process Carriers are designed to **easily adjust to the width of the PCB**. In addition, they can be designed to accommodate either one or two user-specified PCB thicknesses. A **fully adjustable z-depth design** is also available if you prefer. All styles of adjustable process carriers are designed with our **flush-mounted PCB holddowns** to permit processing through printing, placement and reflow without interference.

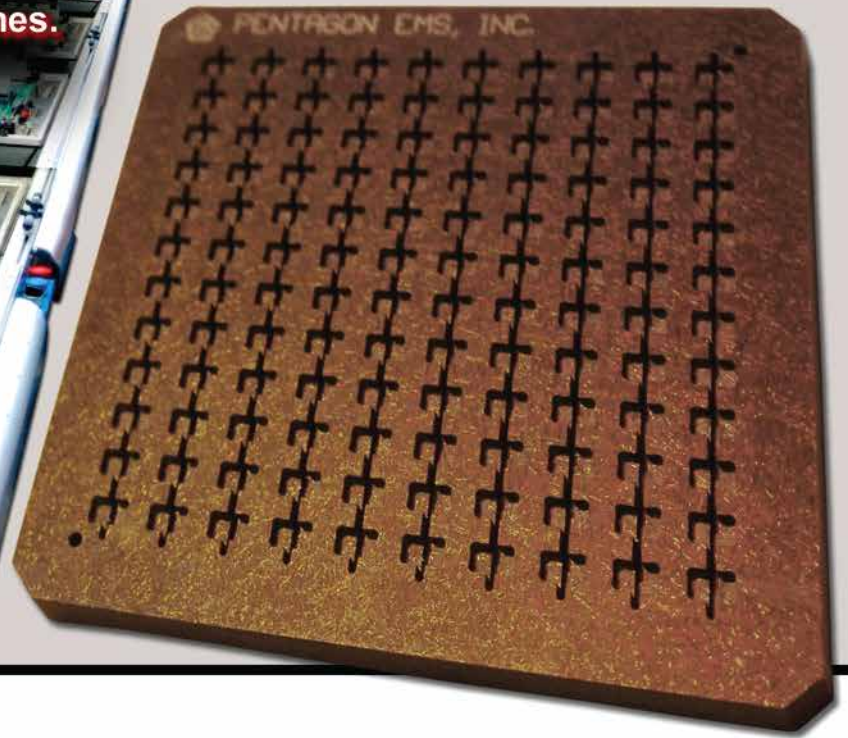
- Adjusts easily to PCB width
- Can be designed to accommodate one or two user-specified PCB thicknesses
- Fully adjustable Z-depth styles available
- Process a variety of PCB sizes and shapes with a single fixture
- Process PCB's with components close to edge
- Flush holddowns will not interfere with screening operations
- Usability Guarantee
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## Matrix Trays

Pentagon EMS offers **ESD safe** Matrix Trays for SMT components for which no standard JEDEC tray exists. These trays allow SMT parts to be presented to and picked up by placement machines in situations where tape and reel presentation is not an option. Pentagon's Matrix Trays are also useful for component bakeout applications.

- Allows SMT parts to be picked up in a repeatable fashion when tape and reel is not an option
- Provides pick and place SMT package presentation solution for components for which no standard JEDEC tray exists
- Useful for component bake-out
- ESD safe composite material
- Usability Guarantee
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# Printer Support Plates

Provide **maximum support** of the PCB through the screen-printing process using Printer Support Plates from Pentagon EMS. The solid PCB support provided by these plates **ensures accurate, repeatable results.**

Vacuum-compatible designs are also available if needed for your application.

Pentagon Printer Support Plates are machined from your choice of either ESD composite or aluminum.

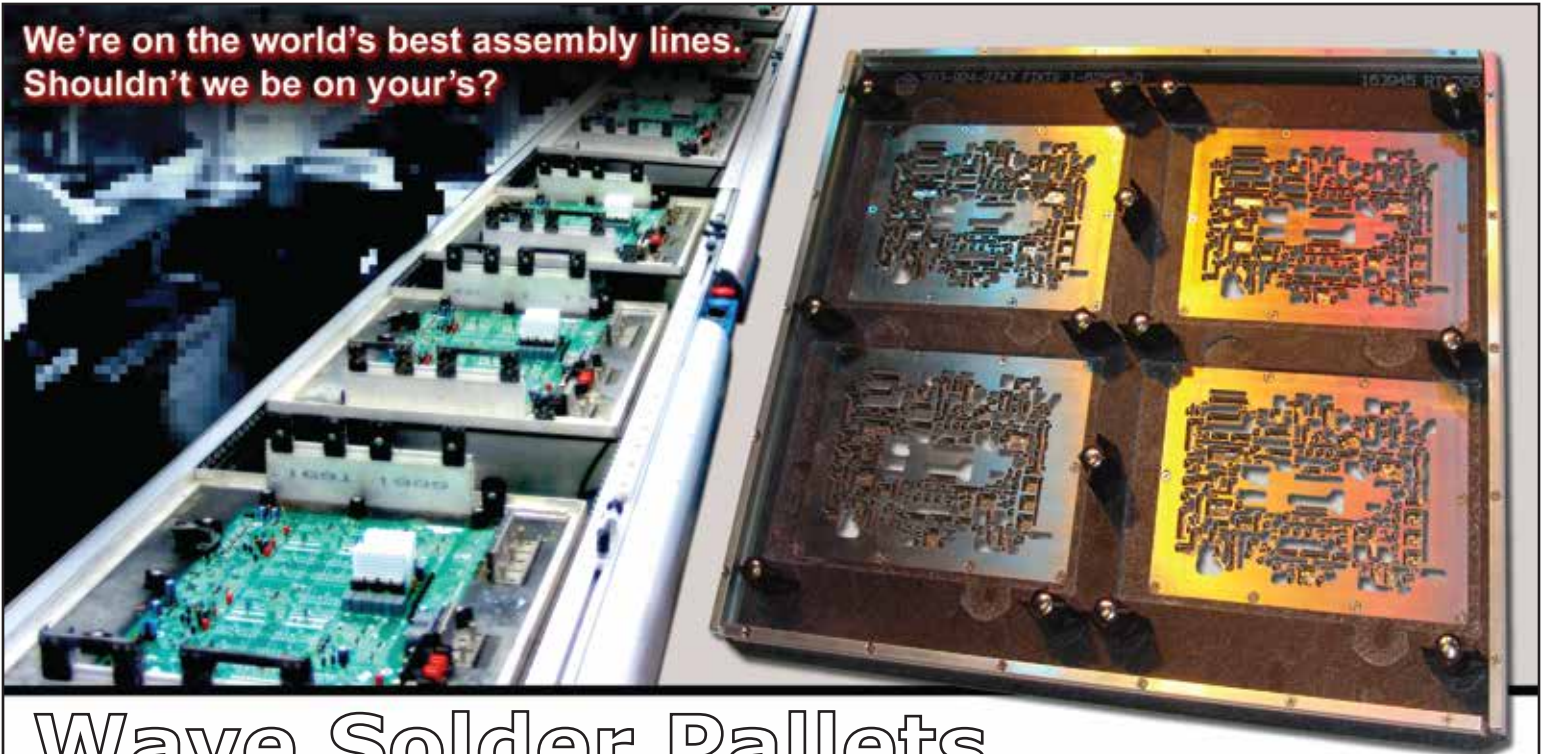
- Provides maximum support to the PCB during the print process
- Ensures accurate, repeatable results
- Vacuum system compatible if needed
- ESD composite or aluminum construction
- Usability Guarantee
- Rewards Program



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# Wave Solder Pallets

**Reduce** cycle times, **eliminate** hand-masking, **increase** throughput and **optimize** your wave solder process with Wave Solder Pallets from Pentagon EMS. Pentagon pallets support the PCB and mask goldfingers, open routings, plated tooling holes, solder-side SMT components, and other critical board features from the wave, while allowing the through-hole leads to be wave soldered.

- Pallets permit wave solder processing of through-hole components while masking solder-side SMT components and critical board features from molten solder
- Maximum possible "Knife Edge" beveling of fixture openings, provide the best possible solder flow to component leads
- Wave Pockets and Solder Channels promote better solder flow
- Ergonomic PCB and component holddowns
- FREE! PCB pocket covers provided with multi-up fixtures
- Anodize option on stiffener bars to indicate the type of wave solder process (ie. organic, no clean, lead free)
- Optional Titanium Edge Steps add extra durability to the fixture
- Optional Titanium Inserts for extremely thin wall areas
- Unlimited custom options
- Usability Guarantee
- Rewards Program



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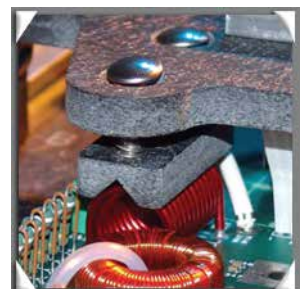
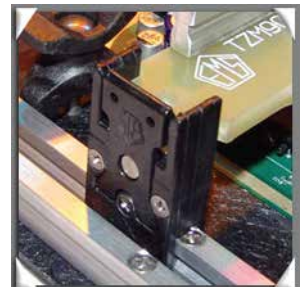
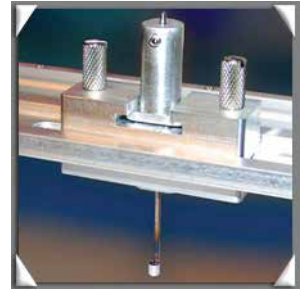
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## Overarm Bars

**Hold down and/or orient topside components, secure the PCB in the fixture, control PCB warpage in large boards** or any combination thereof using Pentagon EMS Overarm Bars on your wave solder fixtures. Use of Overarm Bars can make dramatic improvements to, and **reduce setup time** in your wave solder processes. They can be as simple or as complex as your situation dictates. Whether you choose a **hinged design or a detachable** style, each is easily secured to the fixture using our **spring-loaded latching** mechanism. Detachable style Overarm Bars are **keyed to assure proper orientation** to the fixture and PCB. The Overarm Bar is custom designed for each application, and custom pads are available for **holding odd shaped components**.

- Reduces setup time when numerous components need to be held down
- Provides tight seal to prevent flooding around fixture openings for large PCB's
- Prevent PCB bow or sag
- Visually indicates proper component placement
- Ensures correct component orientation and positioning
- Easy to use, spring-loaded latching mechanism
- Custom pads available for odd shaped parts
- Hinged or detachable designs available
- Usability Guarantee
- Rewards Program



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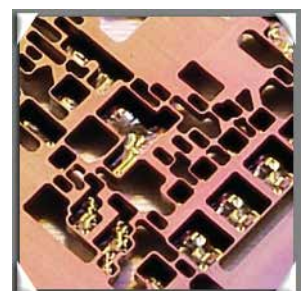
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## Rotating Wave Solder Pallets

**Eliminate** bridges and skips, **reduce** rework and **increase** and **optimize** wave solder process reliability using Rotating Wave Solder Pallets from Pentagon EMS. Pentagon's Rotating Wave Solder Pallets allow you to **eliminate the guesswork** by **testing to determine the best angle** of PCB presentation to the wave **before** purchasing dedicated tooling.

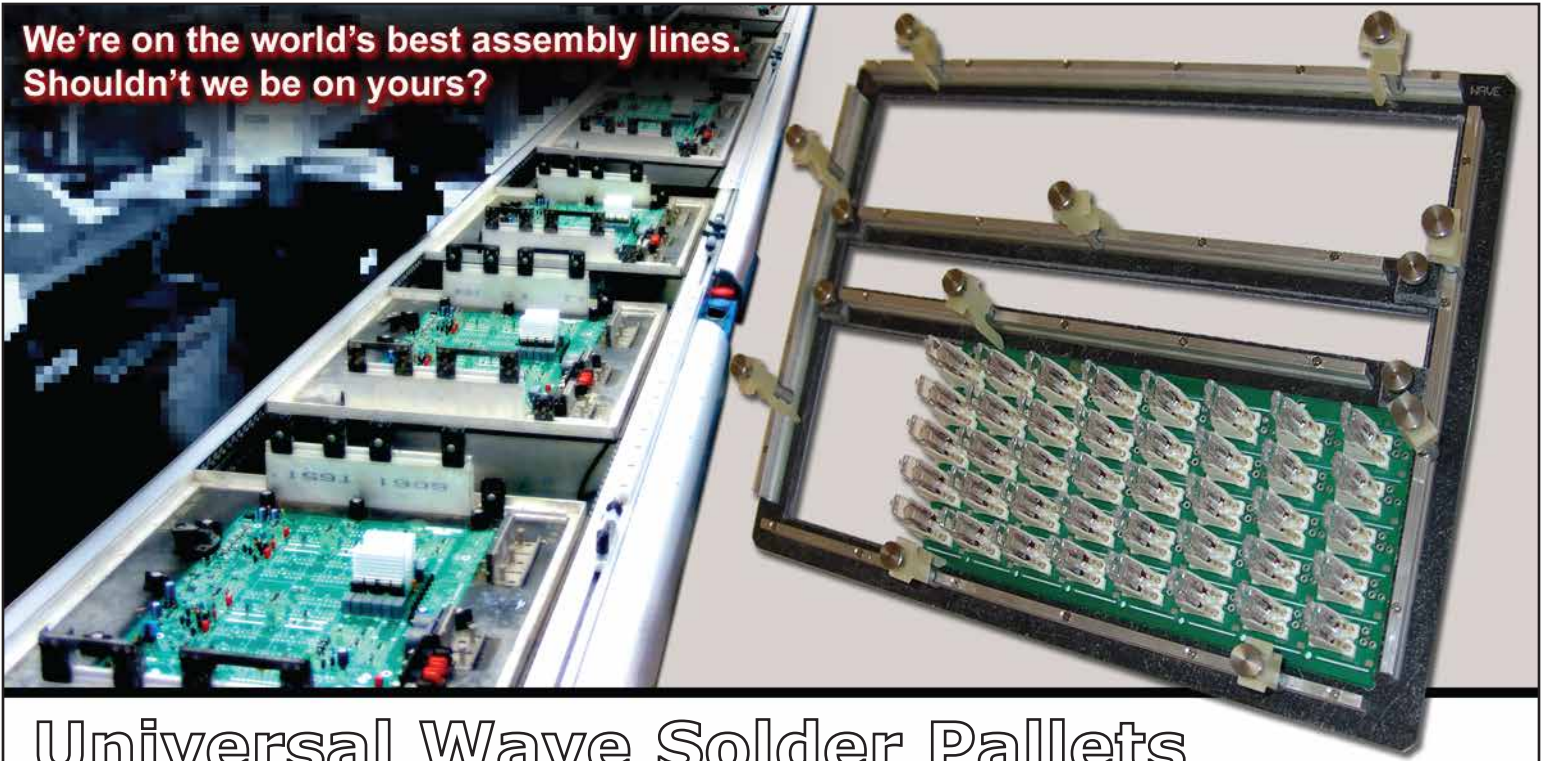
- Reduce or eliminate bridging and skipping
- Angle of rotation adjustable in 5 degree increments
- Same pallet base can host any number of board designs by just ordering a new rotating plate
- Wave Pockets and Solder Channels promote better solder flow
- Same ergonomic PCB and component holddowns
- Anodize option on stiffener bars to indicate the type of wave solder process (ie. organic, no clean, lead free)
- Optional Titanium Edge Steps add extra durability to the fixture
- Optional Titanium Inserts for extremely thin wall areas
- Unlimited custom options
- Usability Guarantee
- Rewards Program



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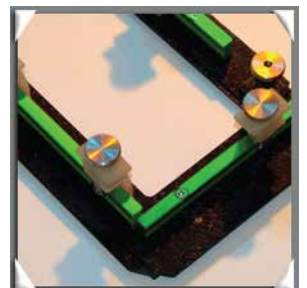
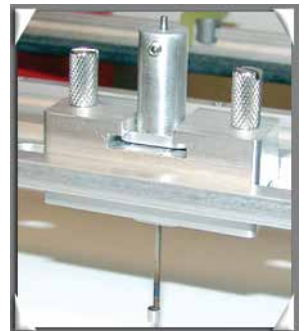
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## Universal Wave Solder Pallets

**Make any PCB conveyor-friendly** with Universal Wave Solder Pallets from Pentagon EMS. Pentagon's universal wave solder fixtures are designed to support a PCB that would otherwise be unable to be processed through wave soldering due to odd shape or proximity of components to the PCB edge.

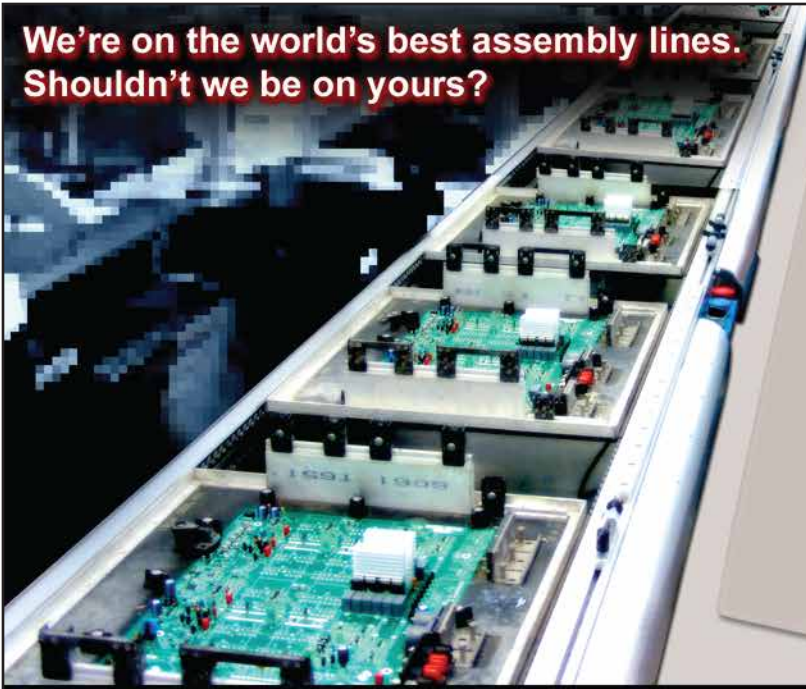
- Makes any PCB conveyor-friendly
- Fully adjustable perimeter holddowns permit easy placement exactly where they are needed
- Center bars easily adjust for PCB width
- Available Overarm Bar option with titanium hook eliminates sag on large boards
- Anodize option on stiffener bars to indicate the type of wave solder process (ie. organic, no clean, lead free)
- Optional Titanium Edge Steps add extra durability to the fixture
- Usability Guarantee
- Rewards Program



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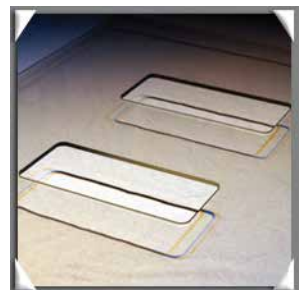
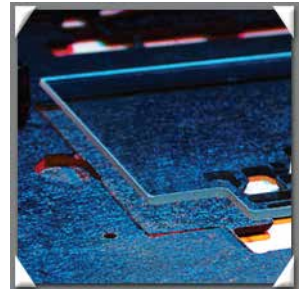


## Wave Glass

See how your fixture is going to perform and make all the necessary setup adjustments to your wave solder operation before loading a single board! You don't need to fly blind.

Pentagon EMS Wave Glass is cut to the exact shape of the perimeter of the circuit board, and fits into the PCB pocket of the fixture. This allows you to see exactly how the solder is flowing in each exposed area of the fixture and adjust your settings according to what you see. Wave Glass is an invaluable tool to aid in reducing the risk of insufficient solder and board flooding.

- Provides a visible means to see how solder flows in each exposed area of the fixture and make adjustments
- Cut to the perimeter shape of the PCB
- Can be cut to allow for internal fixture features also
- Aids in reducing the risk of insufficient solder and board flooding
- 1/8" thick, withstands high temperatures required in the wave solder process
- Usability Guarantee
- Rewards Program



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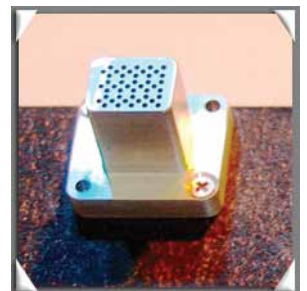
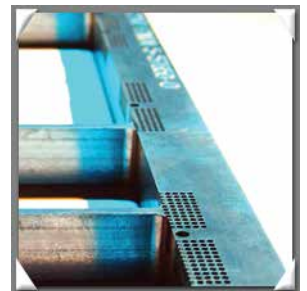
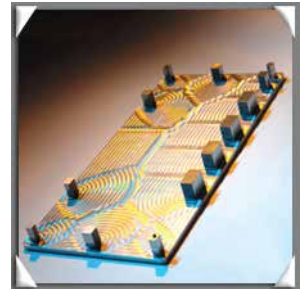


## Press Fit Support Plates

**Save money, save time, increase throughput** and **minimize risk** by using Press Fit Support Plates from Pentagon EMS. The fixture provides complete support for the PCB during installation of press fit components while offering cost savings by **eliminating the need to purchase individual bottom side tools**. Press Fit Support Plates provide **quick alignment of the component to the top tool**, increasing throughput and reducing setup time while minimizing risk of damage to components due to handling.

Pentagon EMS also offers Universal support fixtures. This type of design permits adjustment of guide rails to meet various board sizes. Bottom connector support plates can be interchangeable. This type of Press Fit Fixture is most commonly used for installing perimeter connectors.

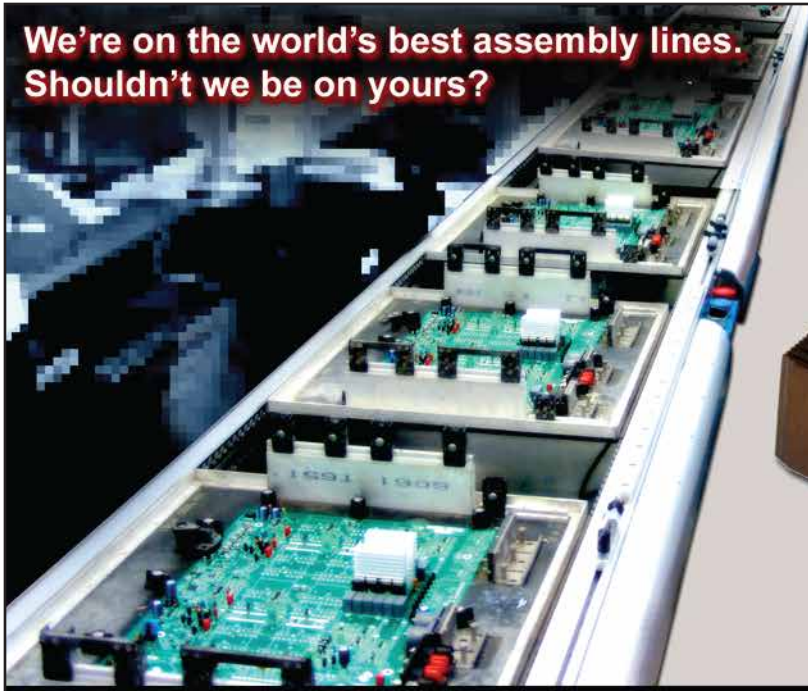
- Reduces cost
- Reduces setup time
- Increases throughput
- Minimizes the risk of damaging components due to handling
- Eliminates the need to buy individual bottom side tools
- Universal fixtures / interchangeable bottom support plates also available
- Machined from Durapol ESD composite or aluminum
- Usability Guarantee
- Rewards Program



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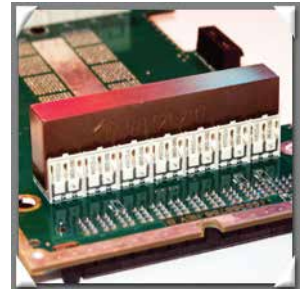


## Press Fit Top Insertion Tools

Pentagon EMS provides high quality, precision crafted Press Fit Top Tools at **a fraction of the cost and lead time** of component manufacturers. Are you spending too much money and waiting too long for Press-Fit tooling?

Press Fit Insertion Tools from Pentagon EMS are typically half the cost of manufacturer's top tooling. Lead times can be as little as a week. For press fit components that are close enough together on the board, we can make a tool for you that presses multiple components simultaneously. Our designs also allow standardization of press stroke length, further **reducing setup time** and **improving throughput**.

- Reduce setup time
- Increase productivity
- Precision crafted from hardened steel, steel or aluminum
- Typically half the cost of tooling available from component manufacturers
- Shorter lead times than tooling available from component manufacturers (usually 1-2 weeks)
- Standardize your stroke length with our custom designs
- Can be designed to press in multiple components at once
- Usability Guarantee
- Rewards Program



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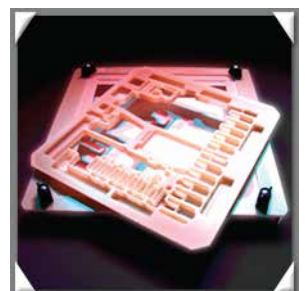
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# Conformal Coat Fixtures

Pentagon's Conformal Coating Fixtures **save time** and provide **simple, fast, accurate and repeatable results** from your conformal coating masking operations. Just put the board in the fixture, close the covers, and you are ready to go. Conformal Coating Fixtures manufactured by Pentagon EMS are designed to support the PCB, yet maintain minimal contact with the PCB to ensure that coating buildup is minimized between the board and the fixture, reducing the time spent on periodic maintenance.

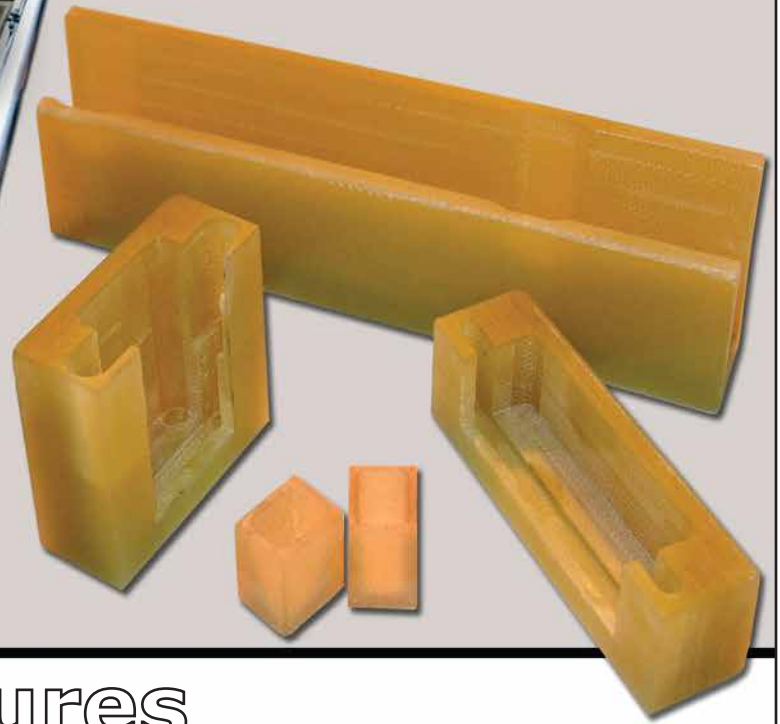
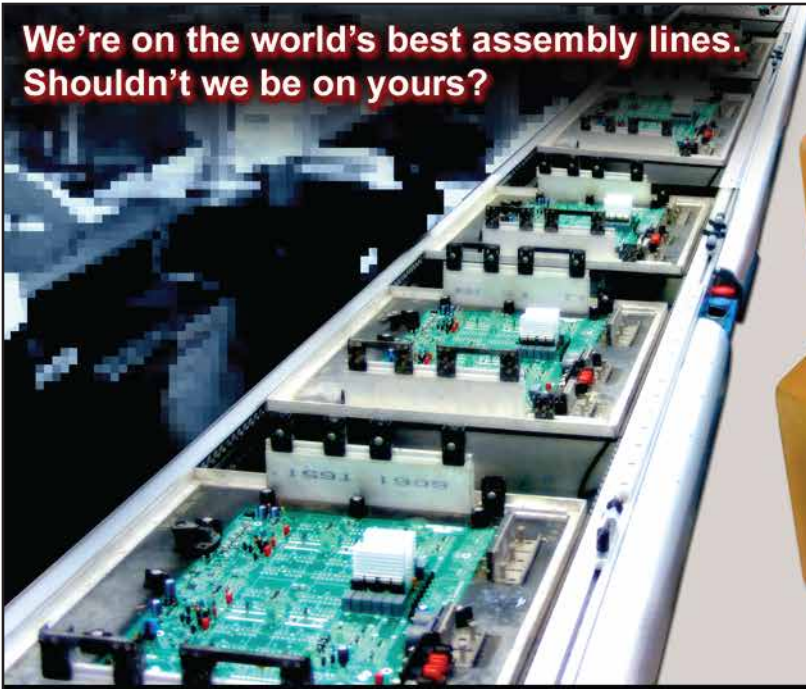
- Eliminate time consuming manual masking
- Process multiple PCB's at one time
- Improve process reliability
- Tabbed design supports the PCB with minimal contact to prevent buildup between PCB and fixture
- Easy handling of PCB's
- Usability Guarantee
- Rewards Program



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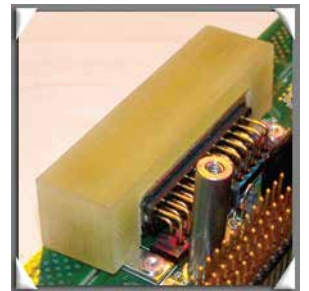
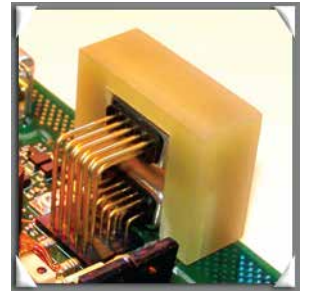


## AOI / 5DX Fixtures

There are alternatives to time consuming component masking for conformal coating.

Pentagon EMS offers component masking boots that **easily fit directly on selected components**. These masking boots are made from durable G10 material and are **custom made** to your exact specifications and there are **no expensive minimum order requirements**.

- Alternative to tape or other time consuming masking method
- Quickly cover a selected component
- Durable G10 material
- Custom designed for your application
- No expensive minimum order requirements
- Usability Guarantee
- Rewards Program

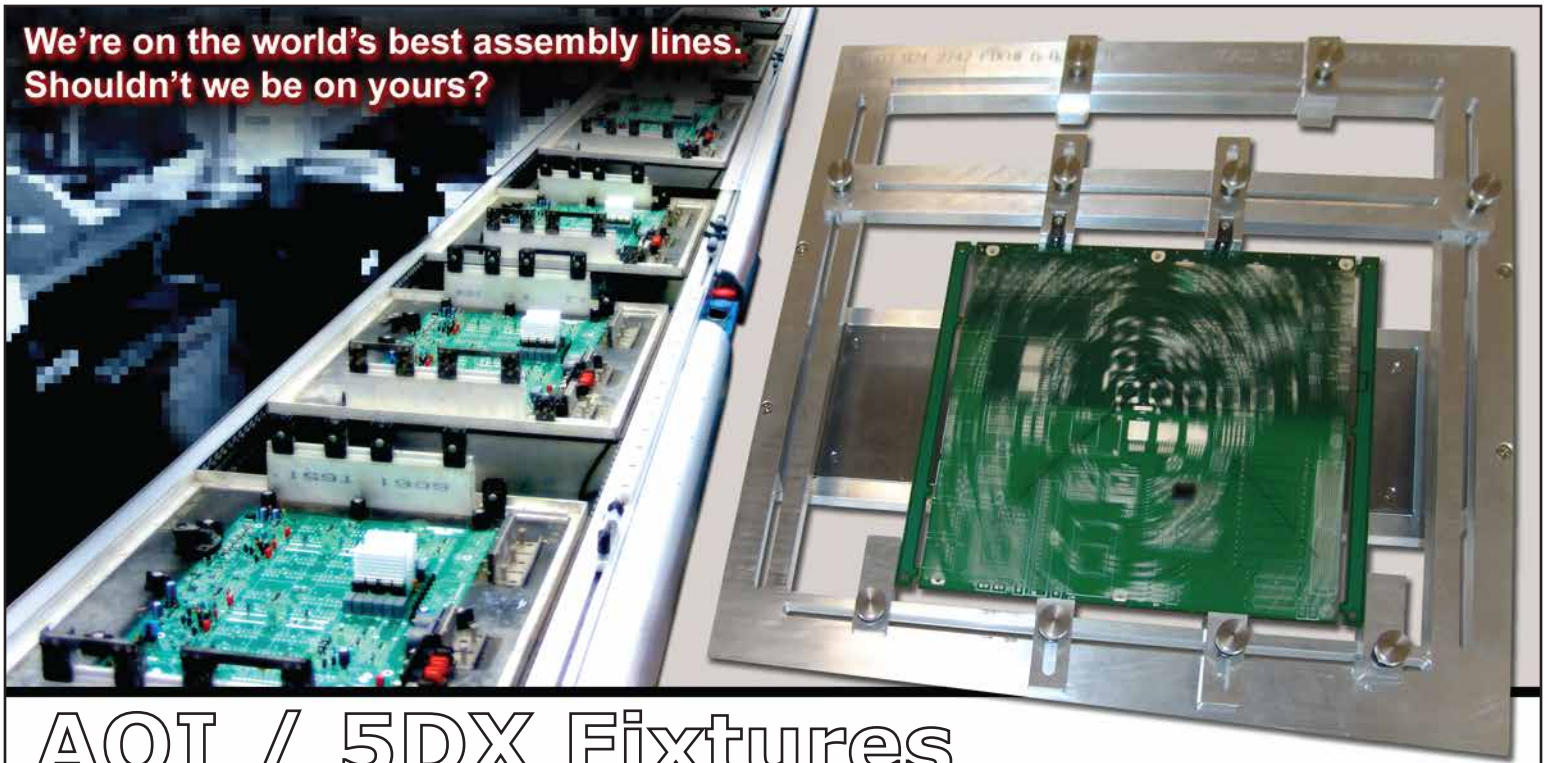


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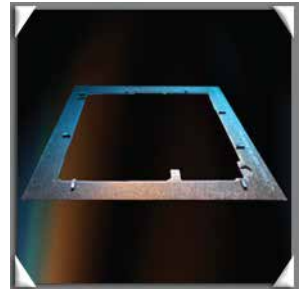


## AOI / 5DX Fixtures

**Prevent false failures** in your AOI and 5DX systems.

Pentagon EMS Inspection Fixtures **securely hold the PCB in place** to prevent the board from skewing and generating false failures. The fixture ensures an **easy to load, repeatable process** for holding odd-shaped boards or PCB's with components too close to the edge. **Low profile PCB holddowns** keep the board firmly in place while not interfering with machine clearance limitations.

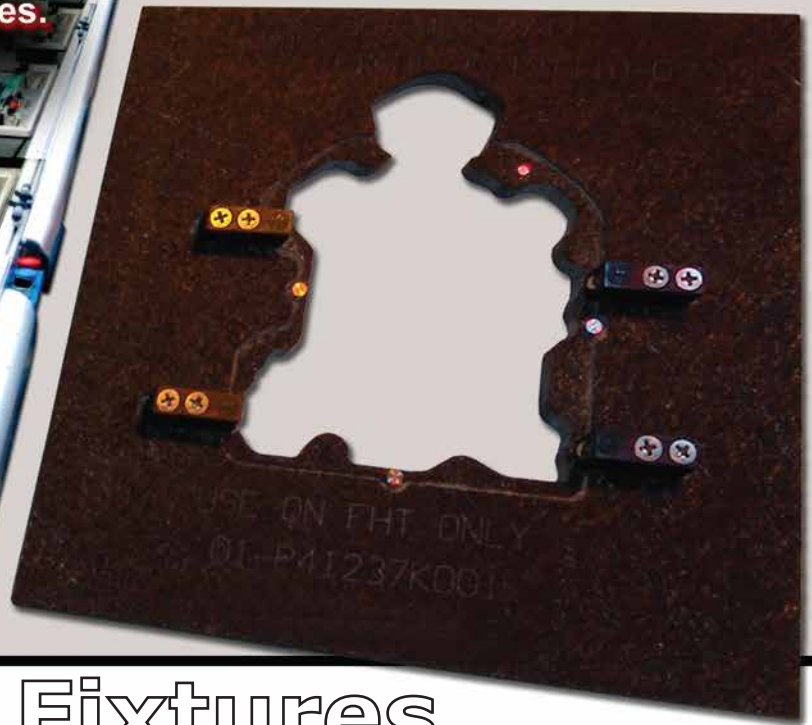
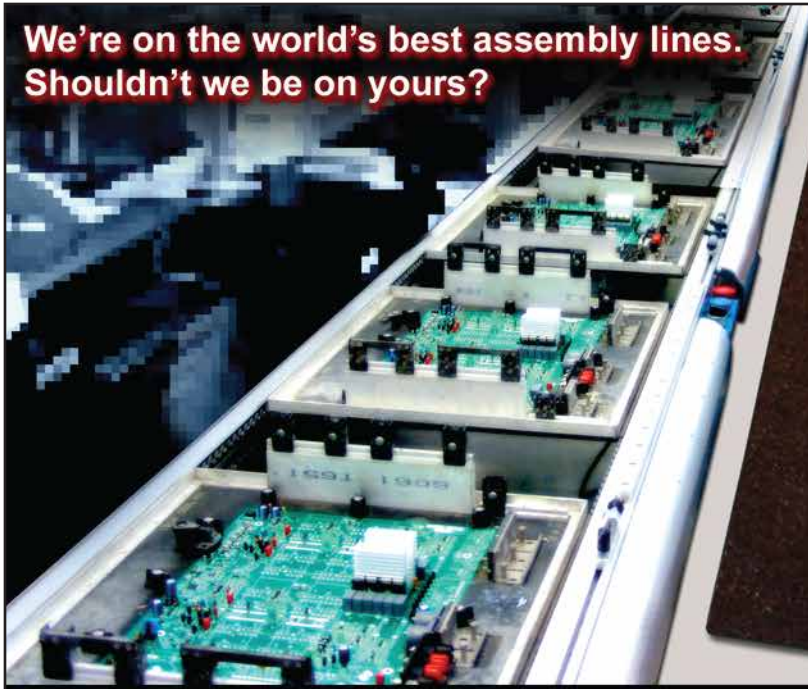
- Prevent false failures due to board skewing
- Ensure process repeatability for odd-shaped PCB's
- Ensure process repeatability for PCB's with components too close to the edge
- Low profile PCB holddowns will not interfere with process clearance limitations
- Usability Guarantee
- Rewards Program



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# Flying Probe Fixtures

As circuitry continues to become more and more dense and complex, the accuracy required for probe positioning in flying probe testing becomes increasingly critical.

Flying Probe Fixtures from Pentagon-EMS **permit probe contact on the PCB top and bottom simultaneously**, while **providing accuracy and repeatability** to the testing process. Flying Probe Fixtures are often used for testing of odd-shaped boards, flex circuits, or when components are too close to the edge of the PCB. Tension holddowns can **control flex warpage** and **eliminate associated false failures**, and single or multi-up fixtures can be designed to **enhance accuracy and increase throughput**.

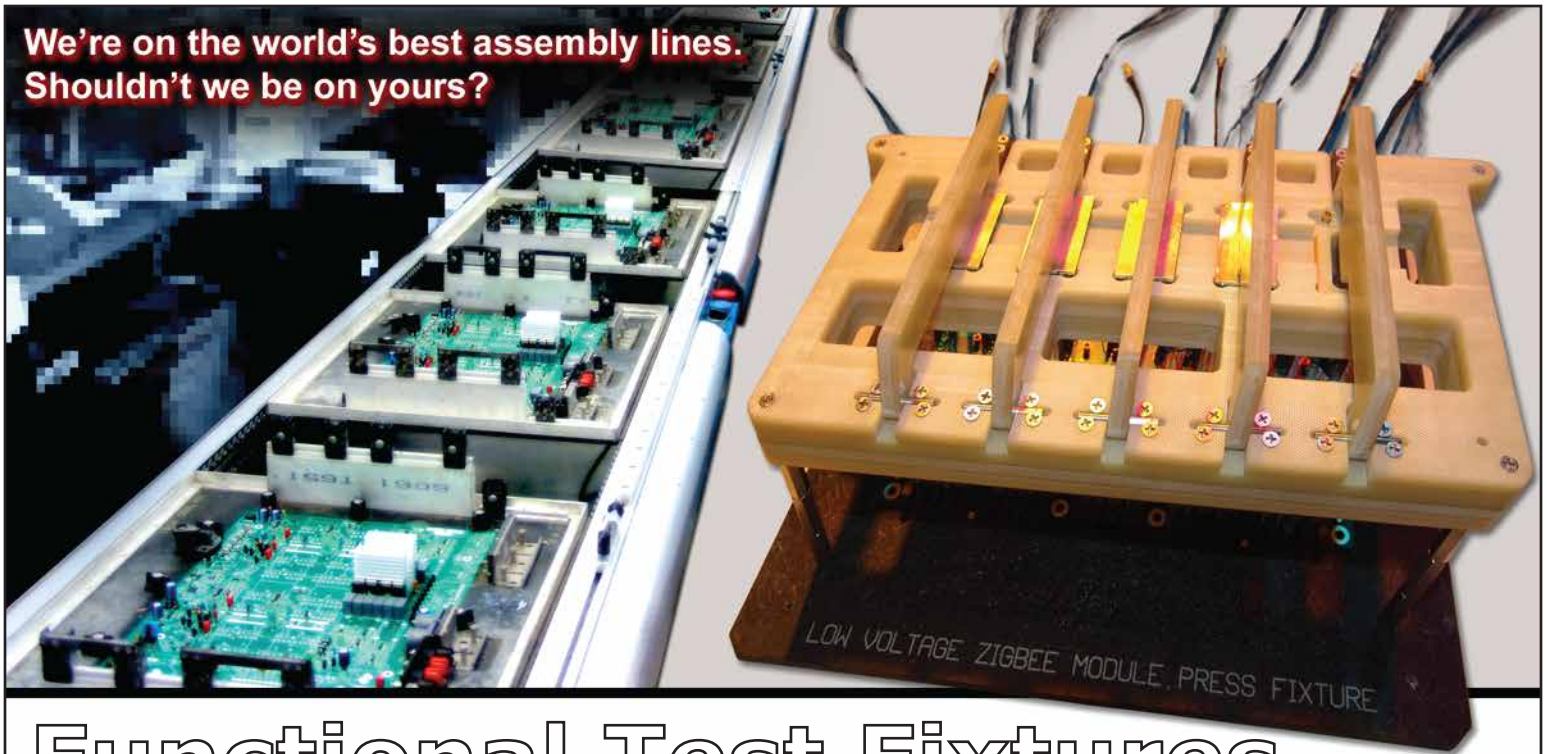
- Permit probe contact on the PCB top and bottom simultaneously
- Provide accuracy and repeatability to testing process
- Tension holddowns control flex warpage and eliminate associated false failures
- Enhance accuracy and increase throughput
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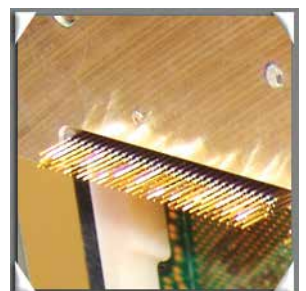
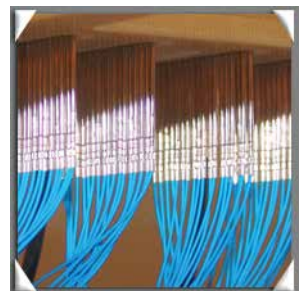


# Functional Test Fixtures

Reliable testing requires a quality test fixture.

Pentagon-EMS offers Functional Test Fixtures that are **customized for your specific application** and can be designed for low volume applications using toggle clamps, or for high volume applications using pneumatically actuated test points. Our Functional Test Fixtures are designed to the highest standards using the best materials on the market today, and can be made for each product or family of products requiring testing.

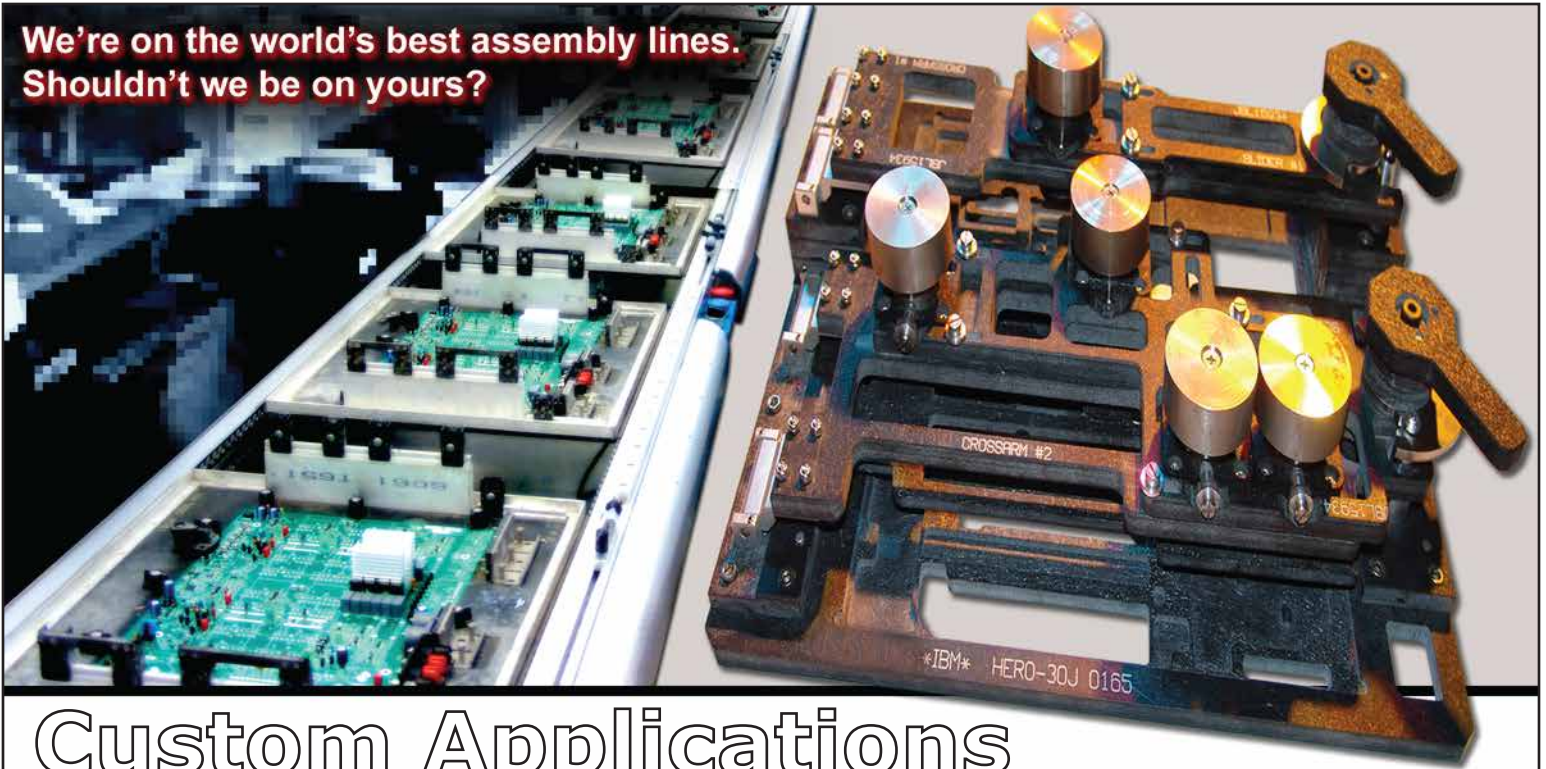
- Customized for each application
- Can be designed for low volume applications using toggle clamps or for high volume applications where the test points are actuated pneumatically
- Can be designed for a specific product or family of products
- Usability Guarantee
- Rewards Program



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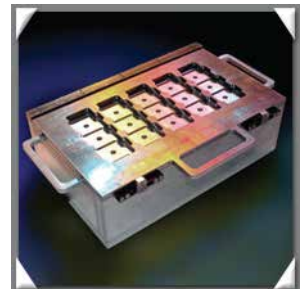
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## Custom Applications

Often, applications arise that call for a custom tooling solution. Pentagon EMS has **successfully addressed many custom applications** by designing and manufacturing tooling such as Label Alignment Fixtures, Final Assembly Jigs, Heatsink Alignment and Bending Fixtures, Lead Trimming and Forming Tools, and more. If you have an application requiring specialty tooling, let our designers create the solution for you.

- Lead Trimming and Forming Tools
- Heatsink Alignment and Bending Fixture
- Final Assembly Jigs
- Label Alignment Fixtures
- Hand Soldering Fixtures
- Robotic Soldering Fixtures
- Component Presses
- Usability Guarantee
- Rewards Program



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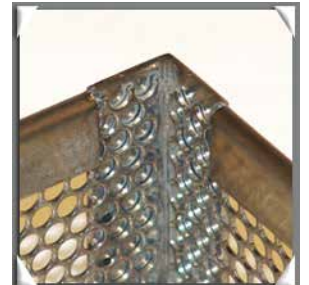
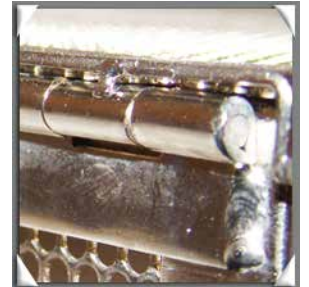


# Wash Baskets

Pentagon EMS offers stainless steel wash baskets for printed circuit board washing. The top, bottom, and sides of these baskets are manufactured from **60% open stainless steel** expanded metal, and are **spot welded** to a hemmed and **welded stainless steel frame**. These sturdy, lightweight wash baskets feature a hinged top and an easy to operate latch, and **can be fabricated to any size** you need.

Optional Tensioners serve to restrict PCB movement within the basket.

- 60% open stainless steel construction
- Hinged top
- Easy Latching Lid
- Solid Welds
- Optional Tensioners aid in restricting board movement
- Lightweight
- Can be fabricated to any size
- Usability Guarantee
- Rewards Program



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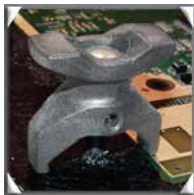
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# Holddowns

Standard holddowns for all Pentagon EMS pallets and fixtures are injection-molded from AMODEL, a glass reinforced resin. AMODEL exhibits high heat resistance, and maintains strength and stiffness throughout a broad temperature range. It also demonstrates excellent chemical resistance and electrical properties. It is **perfectly suited for all lead-free solder processes.**

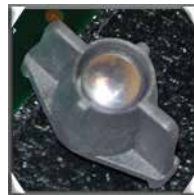
Pentagon EMS Wave Solder, SMT, and component holddowns are designed for maximum comfort and ease of use. Listed below are a few of our most popular styles. Visit our website for a breakdown of all of our standard holddowns.



## **XBALD**

The spring-loaded X-BALD PCB holddown is used in wave solder pallet applications and is designed to be very easy to grip. It can be rotated either direction, and can hold two

PCB's at once on multi-up designs.



## **BALD**

The spring-loaded BALD PCB holddown is used in wave solder pallet applications, and has a slightly lower profile than the X-BALD. It can also be rotated either direction, and

can hold two PCB's at once on multi-up designs.



## **Fender**

a spring-loaded component hold down that exerts top-side vertical pressure on the component to keep

it firmly seated on the PCB. Standard lengths are 1", 1.5", and 2". They can be outfitted with a variety of different pad sizes, and can also utilize custom machined pads for odd form parts, or to perform specific functions such as keeping components registered correctly. The Fender component hold down can also utilize a pivoting mechanism as shown in the lower example. This allows more even distribution of pressure when holding down multiple components.



## **Tensioner**

exerts a pulling force by way of tooling pins engaged in holes in the PCB. This method is the most accurate and reliable, and is required for processing of flex and rigid flex circuitry.

The spring-loaded holddown mounts flush to the top of the fixture / PCB, and will not interfere with screen printing or placement operations.



## **Snugger**

exerts a pushing force against the PCB, preferably against tooling pins engaged into holes in the PCB. Alternatively, if no adequate holes exist in the PCB, the edge of the PCB can be

used for location. The spring-loaded holddown mounts flush to the top of the fixture / PCB, and will not interfere with screen printing or placement operations.

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## Maintenance Kits

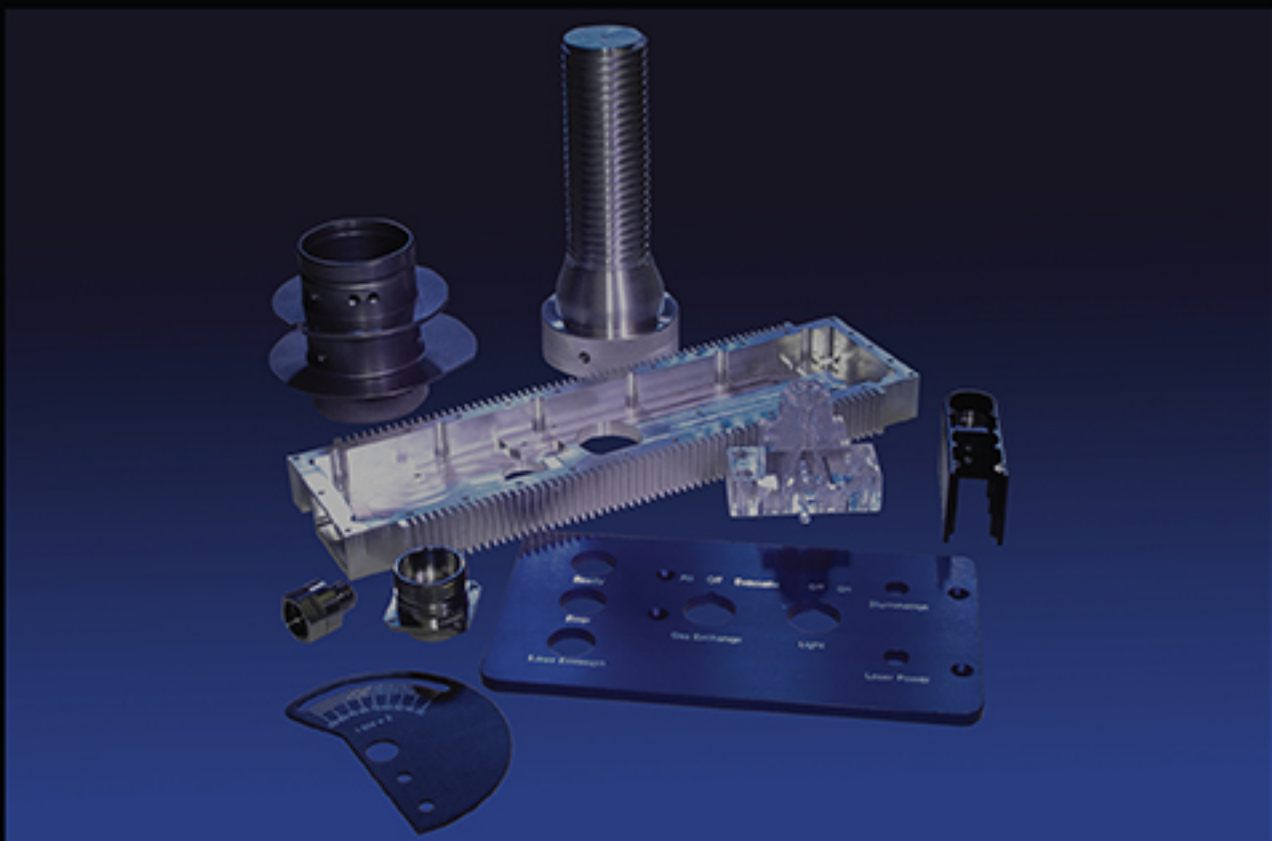
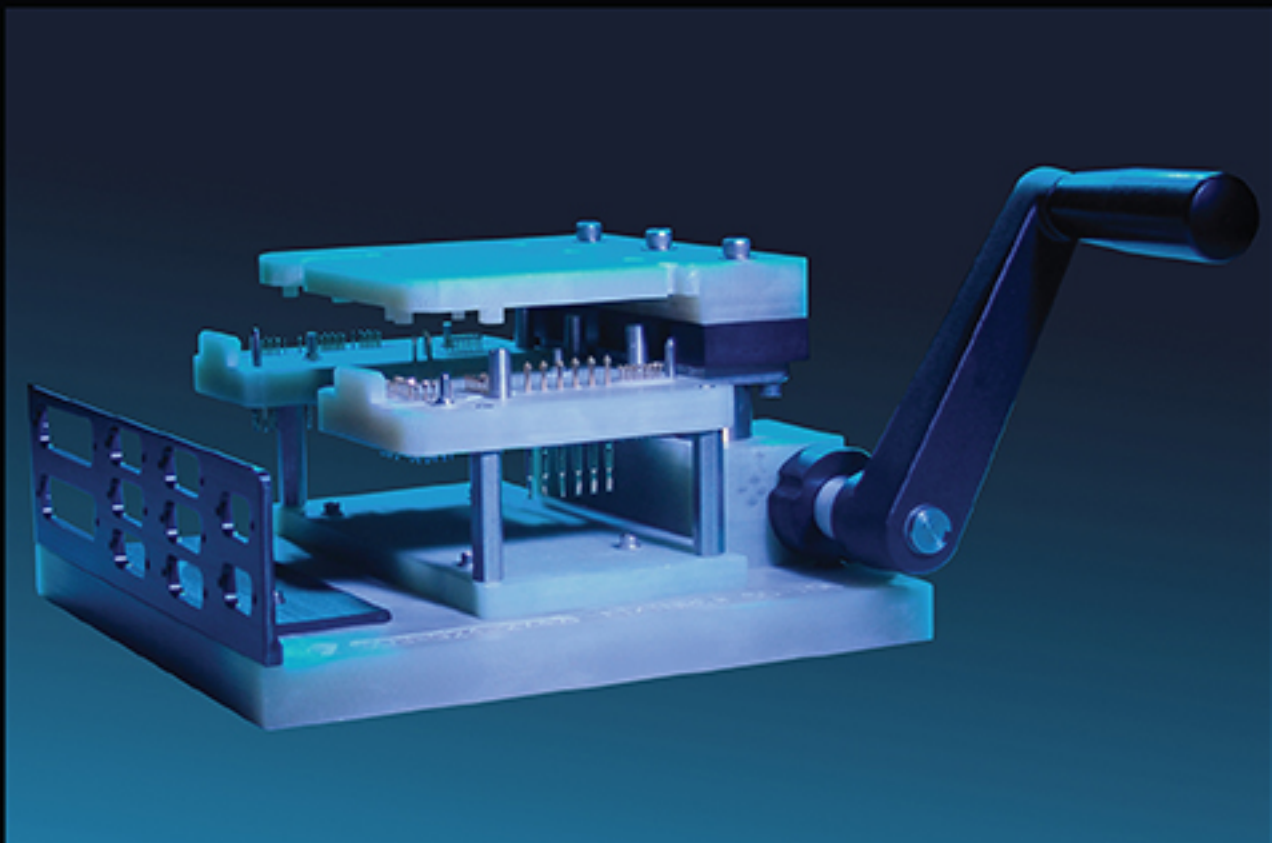
**Keep all of your fixtures and tooling in top performing condition.** Pentagon EMS fixture and tooling maintenance kits are **great for quick tooling maintenance** and can **decrease maintenance-related downtime**. These convenient kits keep all of your spare parts neatly organized in one location, and can include specific hardware for one assembly or general hardware for all assemblies.

- Decrease downtime
- Great for quick tooling maintenance
- Keep fixtures in top condition
- Keep all spare parts neatly organized in one location
- Can include specific hardware for one assembly or general hardware for all assemblies
- Usability Guarantee
- Rewards Program



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